

A revision of the littoral Conidae (Mollusca: Gastropoda) of the Cape Province

by

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SYNOPSIS

Four species of littoral and inshore Cape *Conus* are revised, with emphasis on distribution patterns and geographical variation. *C. scitulus* Reeve and *C. mozambicus* Hwass in Bruguière are regarded as polytypic, the former with subspecies *algoensis* Sowerby and *simplex* Sowerby, the latter with subspecies *lautus* Reeve (a *nomen dubium* here used provisionally pending relevant type studies). *C. tinianus* Hwass in Bruguière and *C. pictus* Reeve are monotypic. Partial synonymies are proposed and type localities designated for all except *lautus*. Egg capsules of *scitulus*, *tinianus* and *mozambicus* are described; eggs are unusually large and few in number for the genus, and development in all is apparently direct.

INTRODUCTION

The family Conidae, like so many groups with attractively patterned shells, was a great favourite among the early conchological writers and iconographers. The heritage of inadequate descriptions, involved synonymies, questionable identifications and incorrect locality records which they have left has proved a constant stumbling block to modern taxonomists endeavouring to unravel the complex systematics of the family.

The present paper is an attempt at elucidating the inter-relationships between the two most problematic groups of South African *Conus*, namely the *pictus-simplex-scitulus-algoensis* and the *tinianus-mozambicus-lautus* complexes. No attempt has been made to draw up full synonymies, as this will only become practicable when the actual type material of all relevant species has been carefully re-examined. Too much confusion has already arisen from attempts to evaluate synonymies from published descriptions and figures alone. Therefore, only names of unequivocal identity are here listed as synonyms. For the same reason all early locality records have been ignored. In fact, it has proved impossible on the whole to formulate a clear idea of distribution patterns—the backbone of modern species concepts—if recognition was accorded to early published locality data. To illustrate this point, out of the seven species and subspecies of Cape *Conus* covered in the present paper, the originally cited type localities of four were totally erroneous and the remainder were originally described from 'locality unknown'. The procedure here undertaken has been to assemble as much data as possible by personal examination of actual specimens and by field observations. Once the true geographical range of each had been established, the interpretation of morphological data became relatively simple. In order to help crystal-

lize distribution patterns, corrected type localities have been designated, bearing in mind local variations, relative abundance and the likelihood of a particular area being readily accessible to collectors in the late 18th to mid-19th centuries, when most of the species concerned were described.

TAXONOMY

Conus scitulus Reeve

Much confusion has encompassed the *Conus scitulus* complex, partly as a result of all-too-frequent misidentifications, partly from the scarcity of fresh or live-taken shells, and partly through ignorance of distribution patterns and local conditions. Examination of a large quantity of material clearly indicates that *scitulus* Reeve, *simplex* Sowerby and *algoensis* Sowerby must be regarded as forming a single polytypic species. Not only is sculpture, general shape, profile of spire, form of egg capsule (where known) and radula structure identical, but the colour pattern in each is but a variation on a single fundamental theme. On the other hand, ranges are allopatric (fig. 1), so these taxa cannot be regarded as ecomorphs or individual variants. As a species, *C. scitulus* may be defined thus:

Shoulder moderately angular, point of suture slightly below shoulder, giving spire a somewhat stepped profile; apex somewhat papillose. Spire and top of shoulder with fine spiral striae, sometimes very faint, crossed by much finer, curved growth lines; base with fine spiral lirae. Ground colour white, basic colour pattern consisting of a chestnut or chocolate-brown band or series of blotches below the shoulder and sometimes around the base, joined by axial stripes in *simplex*, while in *algoensis* these axial bands have merged laterally to cover most of the body whorl, leaving only a series of median white blotches. Aperture white to dark violaceous-brown. Periostracum thin, transparent, moderately smooth, pale olive-yellow in colour, giving the shell a yellowish cast.

Radula (examined in all three subspecies) similar to that of *mozambicus*, save that the finely denticulated tract (q.v.) appears to be less extensive; unfortunately, however, no large examples are available for examination. As in *mozambicus*, the radula is referable to the vermivorous group of Endean & Rudkin (1965: 242) and Lim (1969: 160).

Egg capsules: Samples of both *scitulus* and *simplex* (collected by Mrs. C. M. Connolly) have been examined. In shape they are rather typical for the genus (cf. Kohn, 1961, 1961a), being asymmetrically purse-shaped and compressed, with one face more convex than the other. The stalk is moderately thick and broad, but varies greatly in breadth, and may be scarcely demarcated from the capsule part. Walls are moderately thin, surface sometimes with the merest traces of folds along the edges; exit window not visible. A typical capsule measures 9 mm in height, 7 mm in width.

No pre-veliger stage embryos were present in any of the capsules examined, but veliconchas have been found in both subspecies. These number one to three per capsule, but are sometimes accompanied by one or two retarded veligers. The presence of direct development, together with the limited number of embryos, indicates that the eggs may be presumed to be large and yolky, as in *tinianus* and *mozambicus*. Each veliconcha consists of $1\frac{3}{4}$ to 2 whorls, measuring 2.6×1.5 mm; spiral striae are well-developed on the base and below the suture. In colour they are reddish-fawn, with a whitish nuclear whorl.

Distribution: Table Bay to Cape Agulhas; discontinuities appear to exist between the ranges of the three subspecies.

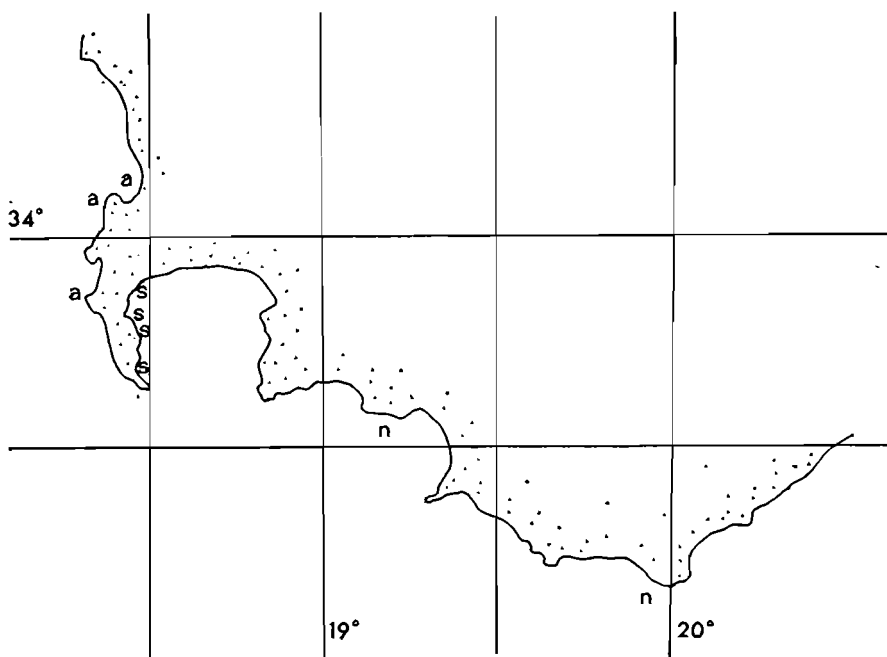


Fig. 1. Map of south-western Cape, showing geographical distribution of *Conus scitulus* Reeve. Letters indicate localities from which specimens have been examined (see text).
 n = *Conus scitulus scitulus* Rve.
 s = *Conus scitulus simplex* Sow.
 a = *Conus scitulus algoensis* Sow.

The distribution of *C. scitulus* as a species is clearly determined by temperature factors. Thus, subspecies *algoensis* inhabits the cold west coast of the Cape Peninsula, while *simplex* occurs on the opposite side of the Peninsula (an area which for most of the year is the coldest part of False Bay), and *scitulus* s.s. appears to be restricted to the Hermanus–Cape Agulhas area, in which (to quote Stephenson, 1944) there is ‘a distinct recrudescence of cold-water species’ (at all events in the Hermanus–Danger Point section). A brief discussion of these regions will explain how local differences in conditions have favoured the development of three subspecies within less than 500 km of coastline. An important point to be borne in mind is that the presence of direct (non-pelagic) development in *scitulus* has no doubt hindered gene exchange between populations.

The west coast region, home of the subspecies *algoensis*, is the most clearly defined of the South African marine provinces (see Stephenson, 1944). This part of the coastline is under the direct influence of the cold, north-flowing Benguela current, producing inshore temperatures ranging from about 10° to 16°C. (Stephenson, 1948, and Shannon, 1966). Periodic upwelling of deep-lying water, rich in mineral salts, is also characteristic of the region. The effect of this on the molluscan fauna is unknown, but it is probably partially responsible for the unusually large size attained by many species in this area (not in the case of *C. scitulus*). A similar trend towards gigantism also occurs in the guano-rich waters

of Bird Island in Algoa Bay, at least in *Patella oculus* Born and *Oxystele sinensis* (Gmelin). Two coloration tendencies are also apparent. One is a tendency towards melanism, shown by *Conus scitulus algoensis* and by a number of other species, such as *Tricolia capensis* (Dunker), *Helcion dunkeri* (Krauss) and *Crassispira hottentota* (Smith). However, in many other species the local populations tend to have pale or colourless shells; examples are *Mitra picta aerumnosa* Melvill, *Carditella rugosa* Sowerby and *Cinysca granulosa* (Krauss).

The west coast biota is of course not exclusively restricted to the Atlantic coast, and many component species extend as far east as Cape Agulhas or further. However, from Cape Point eastwards this biota intermingles with the warmer water south coast component. Overlapping of the subtraction margins of two faunal regions often results in the development of a local 'transitional' fauna. The subspecies *scitulus* s.s. and *simplex* may be regarded as two components of such a transitional complex, which have developed within the region of overlap in circumscribed areas where local conditions approach those of the west coast.

While there is no clear-cut difference in conditions between False Bay and the west coast of the Cape Peninsula, summer temperatures are somewhat higher, and as noted by Stephenson (1944: 295) this area forms the western limit for many warm water species. *C. s. simplex* has only been examined from the east side of the Cape Peninsula, the coolest part of the False Bay shoreline during spring and summer (cf. Atkins, 1970: fig. 2). It appears to be absent from the northern part of the Bay which presents an unsuitable habitat not only on account of the very sandy nature of the coast, but also on account of the relatively high summer temperatures (Atkins, loc. cit.), the result of solar warming of the shallow inshore waters. This region will probably prove to be a barrier preventing the range of *simplex* from spreading throughout False Bay.

The range of the nominate subspecies requires further investigation. Although available data on the region which it is known to inhabit are scanty, Stephenson (1944: fig. 5) showed there to be a marked falling off in the number of cold temperate water species in the Cape Agulhas area, and this will probably prove to form the eastern limit of the range of *scitulus* (no sign of the species was apparently found at Stilbaai by the late J. Muir—S. Afr. Mus. coll.). On the other hand Stephenson found, in the Cape Hangklip–Danger Point stretch of coastline, a marked drop in temperature conditions, approaching those of the west coast, and Day (1970: 213) refers to the local upwelling of cold water on the west shores of the main points in this area (including Cape Agulhas). These factors would seem to favour the occurrence of *scitulus* at least as far west as Cape Hangklip, although so far it has only been found as far as Hermanus.

Conus scitulus scitulus Reeve

(Fig. 2, upper right; fig. 4a–c)

Conus scitulus Reeve, 1849: pl. 9, fig. 283; Barnard, 1958: 89 (synonymy).

Non: *Conus scitulus*; Marsh & Ripplingale, 1964: 28, pl. 3, fig. 12. [= *simplex* Sow.].

Conus pictus var. *scitulus*; Turton, 1932: 15. [= *pictus* Rve.].

Distribution: Hermanus (S. Afr. Mus.) to Cape Agulhas (Nat. Mus.: *H. C. Burnup*, *P. Elston*, *Mr. & Mrs. M. C. Giles*; also coll. *Mrs. C. M. Connolly*). Type locality unknown, here designated as Cape Agulhas.

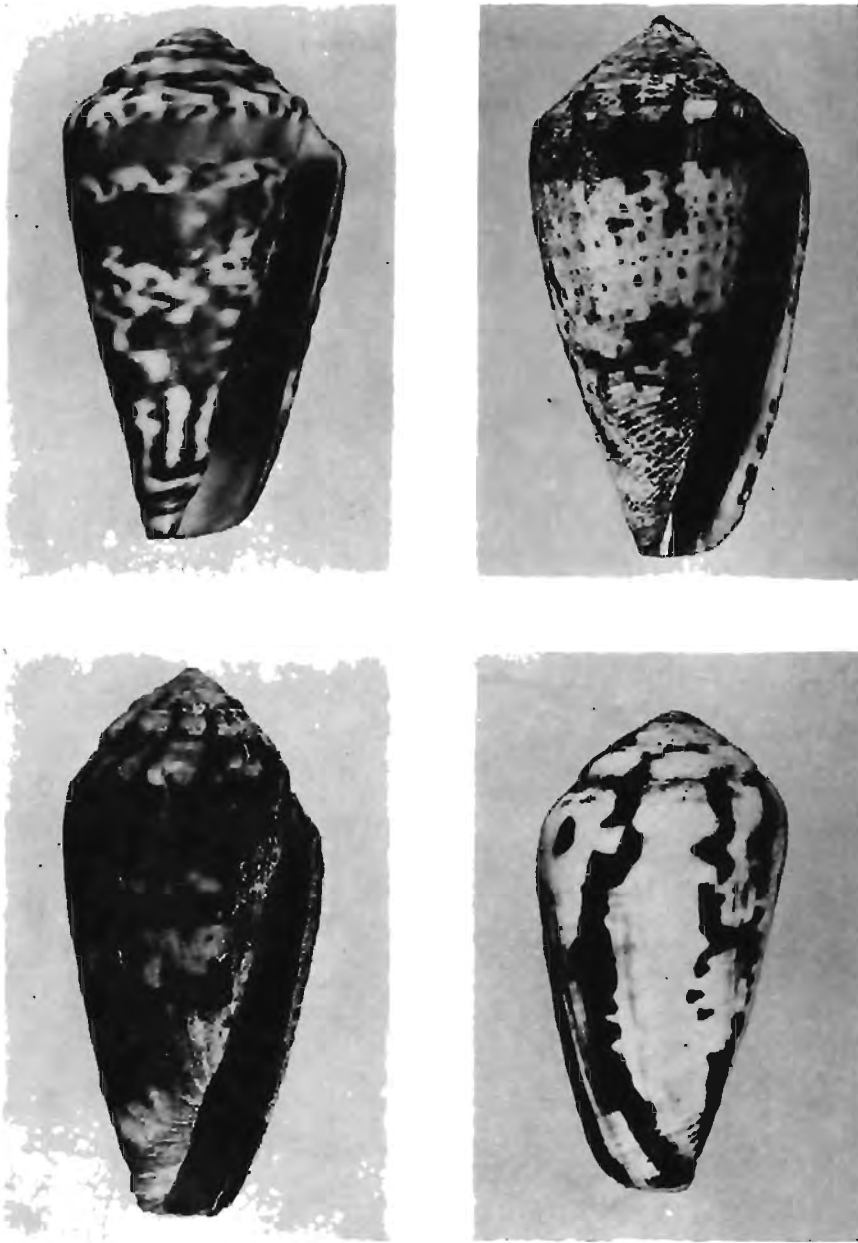


Fig. 2. *Conus pictus-scutulus* superspecies. Upper row: left, *C. pictus* Rve. from Jeffreys Bay, dimensions $36,9 \times 20,2$ mm; right, *C. scutulus scutulus* Rve. from Cape Agulhas, $23,1 \times 12,1$ mm. Lower row: left, *C. scutulus algoensis* Sow., Table Bay, (coll. Mrs. C. M. Connolly), dimensions $30,2 \times 14,5$ mm; right, *C. scutulus simplex* Sow., atypical form lacking shoulder band, from Simonstown, dimensions $27,4 \times 14,4$ mm.

Characteristics: Ground colour whitish, with a broad, continuous (very rarely interrupted) chocolate- or dark chestnut-brown band below the shoulder (in beach shells this becomes worn into different shades of pink, orange or brown), and a series of irregular blotches, sometimes merging to form a continuous band, above base; these two zones may form incipient axial flames, but these never appear to develop into the continuous longitudinal stripes which characterize the subspecies *simplex*. White shoulder blotches small, extending only slightly below the shoulder angle; median area of body whorl normally with thin articulated lines of conspicuous brown and white dots. A peculiar pale colour form sometimes occurs in which the markings are completely absent, apart from a continuous brown shoulder band, and traces of a brown tinge around the base.

Dimensions: 26,3 × 13,1 mm; 26,3 × 13,8 mm; 32 × 17,7 mm (worn and slightly distorted); 36 × 19,2 mm (an exceedingly worn shell).

Remarks: Reeve's figure clearly shows the characteristic articulated spiral lines and typically restricted shoulder blotches.

At Cape Agulhas this species lives buried in gravel under rocks at low spring-tide level (pers. comm. Mrs. Connolly).

Conus scitulus simplex Sowerby

(Fig. 2, lower right; fig. 3; fig. 5b)

Conus simplex Sowerby, 1857-8: 31, pl. 9, fig. 199, pl. 14, fig. 309; Barnard, 1958: 90; Marsh & Rippingale, 1964: 73, pl. 10, fig. 8.

Conus scitulus (non Reeve); Marsh & Rippingale, 1964: 28, pl. 3, fig. 12.

Distribution: East coast of Cape Peninsula, between Muizenberg and Buffels Bay. Material examined from Muizenberg, Simonstown, Miller's Point and Buffels Bay. The original locality given by Sowerby, namely 'East Indies', is certainly erroneous, and Barnard's record from Mauritius is also unacceptable. The type locality is here restricted to Simonstown, False Bay.

Characteristics: Band below shoulder normally (but not always) interrupted, and occasionally totally absent; basal zone usually poorly or not developed; body whorl marked by conspicuous, wavy, longitudinal brown or chestnut stripes, often continuous from shoulder to base, but usually more or less interrupted medially. Shoulder slope with larger and generally somewhat fewer blotches than in nominate subspecies, these extending slightly further over the shoulder. Pale areas of the body whorl normally without articulated spiral lines, although irregular traces may occasionally be seen. Some specimens from Simonstown (coll. Mrs. C. M. Connolly) show a tendency, chiefly on the later part of the body whorl, for the axial bands to expand transversely and merge, producing a condition similar to that found in *algoensis*. The occurrence of these specimens in the middle of the range of *simplex* indicates that they cannot be regarded as hybrids.

Dimensions: 67,5 × 33,3 mm, 64,7 × 29,6 mm (Simonstown, dredged, coll. Mrs. C. M. Connolly). This is the largest of the three subspecies, although specimens rarely reach the dimensions cited above, and intertidal specimens are considerably smaller.

Remarks: *C. s. simplex* lives in sand or fine gravel in crevices or under rocks in low tide pools, becoming active as the tide turns (personal observation); occurs down to a

depth of 11 fathoms (Barnard), 53 metres (Day, Field & Penrith, 1970: 74). Feeds on tiny sand-dwelling polychaete worms (Mrs. C. M. Connolly, pers. comm.).

Conus scitulus algoensis Sowerby

(Fig. 2, lower left)

Conus algoensis Sowerby, 1934a: pl. 54, fig. 66; 1834b: 18; Tryon, 1884: 69, pl. 22, fig. 52.

? *Conus algoensis*; Krauss, 1848: 131; Bartsch, 1915: 14; Marsh & Rippingale, 1964: 74, pl. 10, fig. 9.

Non: *Conus algoensis*; Turton, 1932: 14 [= *tinianus* Hwass].

Distribution: Table Bay (coll. Mrs. C. M. Connolly) to Sea Point, Cape Town (Nat. Mus.: P. Elston), and Kommetjie (Nat. Mus.: R.K.). The Cumingian locality of 'Algoa Bay' is quite incorrect (even Sowerby, 1892: 29, queried it) and subsequent reports from this locality are probably based on narrow dark examples of *tinianus*. The type locality is here restricted to Table Bay.

Characteristics: Body whorl largely chocolate-brown, with one or two rows of irregular white blotches and sometimes traces of a third on the base; shoulder blotches as in *simplex*. Body whorl rather narrower and less conical than the other subspecies.

Dimensions: 34,6 × 15,4 mm, 30,2 × 14,5 mm, 25,7 × 11,5 mm.

Remarks: Small specimens (in which the shoulder blotches may be rather obscure) can easily be mistaken for young *mozambicus*, while large examples without locality data could be confused with some colour variants of *tinianus*; Barnard (1959: 91) in fact suggested that it was a synonym of the latter. However, *C. s. algoensis* may be distinguished from both by the outer lip meeting the body whorl *below* the shoulder, instead of on it, by the higher, distinctly stepped spire, and by the conspicuous white shoulder blotches.

The identification of the present subspecies was kindly confirmed by Mr. S. Fenwick, after comparison with five syntypes in the British Museum (Natural History).

Conus pictus Reeve

(Fig. 2, upper left)

Conus pictus Reeve, 1845: pl. 18, sp. 98; Bartsch, 1915: 14; Turton, 1932: 14; Barnard, 1958: 88; Marsh & Rippingale, 1964: 149, pl. 21, fig. 22.

Conus beckeri Sowerby, 1911: 352 **syn. nov.**

Conus pictus var. *scitulus* (non Reeve); Turton, 1932: 15.

Conus pictus var. *jaspideus* (non Kiener); Turton, 1932: 15.

Distribution: Jeffreys Bay (Nat. Mus.), Algoa Bay (Barnard), Port Alfred (Bartsch, Turton), Great Fish River mouth (Bartsch), East London (Nat. Mus.), Gonubie and Bulugha, near East London (E. L. Mus. and private collections). Type locality unknown, here restricted to Port Elizabeth. Although not littoral in habitat this species is included for comparison with *scitulus*.

Remarks: Although this species has frequently been confused with *scitulus*, it differs in the more broadly and regularly conical body whorl, in the more markedly stepped spire and distinctly concave shoulder slope, and in the absence of any sign of spiral striae on the latter. The coloration appears to be brighter and more variable, although no live-collected shells are available; in the dead material examined, the markings range in colour from salmon-pink to fawn or chestnut. In the development of articulated spiral lines *C. pictus*

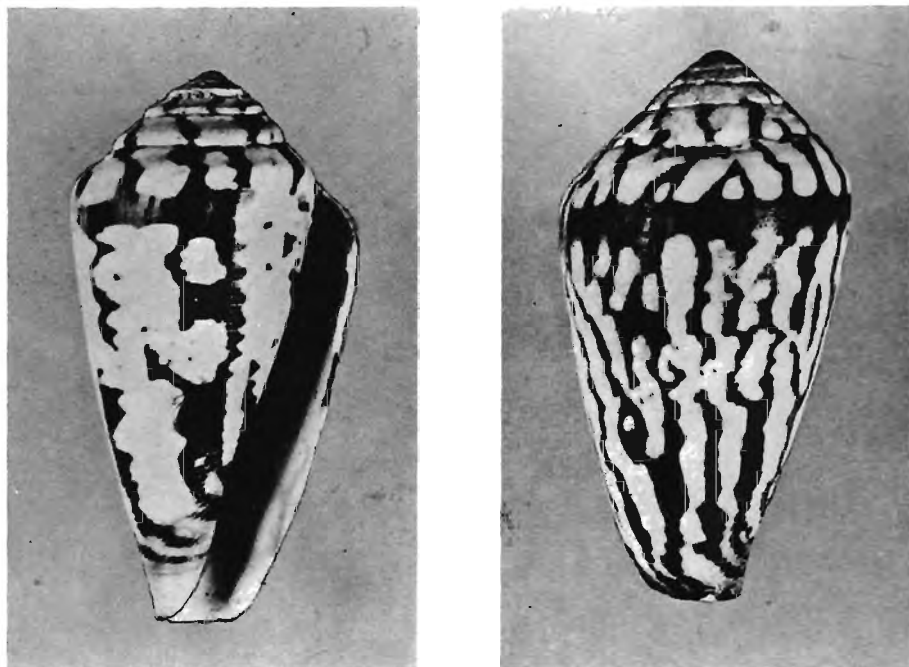


Fig. 3. *Conus scitulus simplex* Sow., two colour variants. Left, typical form, with interrupted shoulder band, from Simonstown, dimensions $32,7 \times 17$ mm. Right, aberrant form with continuous shoulder band from Muizenberg, dimensions $40,3 \times 21,6$ mm.

resembles the nominate subspecies of *scitulus*, save that in the former these are usually (but not always) concentrated into two transverse zones, one above and one below the middle of the body whorl. However, a similar pattern may very occasionally develop in *C. s. scitulus*, and when such shells show a salmon-pink subsutural band as a result of wear there is a close approximation to the colour pattern found in *pictus*.

Although a wide discontinuity appears to exist between the ranges of this apparently monotypic species and the *scitulus* complex, *C. pictus* is both rare and an infratidal dweller, and may yet turn up in the intervening area. Should such specimens bridge the apparent hiatus in morphological detail, *pictus* would take priority over *scitulus*. In the meantime the two may be regarded as forming a well-defined superspecies.

The largest specimen examined measures $36,9 \times 20,2$ mm (Nat. Mus.).

C. beckeri was regarded by Tomlin & Winslow (1927: 45) as a synonym of *C. aurora* [= *tinianus*], a view which is certainly incorrect, although there is a marked resemblance to the conical form of *lautus* Reeve (which Tomlin synonymized with *aurora*). However, in shape and colour it equally resembles *pictus*, and Sowerby's statement that the whorls of the spire were 'graduated, smooth and concave at the top' tips the scale in favour of the latter. Moreover Sowerby specifically compared it with *lautus*, noting that it differed considerably in the character of the spire.

Conus tinianus Hwass in Bruguière

(Fig. 4 f, g, h)

Conus tinianus Hwass in Bruguière, 1792: 713, pl. 338, fig. 2; Kohn, 1968: 487, pl. 9, fig. 117 (holotype).
Conus aurora Lamarck, 1810: 423; (*partim*) Tomlin and Winslow, 1927: 43 (synonymy); Barnard, 1958: 91 (synonymy), fig. 2b; Barnard, 1969: 601.
Conus rosaceus Dillwyn, 1817: 433.
Conus loveni Krauss, 1848: 131, pl. 6, fig. 25.
Conus alfredensis Bartsch, 1915: 13, pl. 1, fig. 12.
Conus lavendulus Bartsch, 1915: 12, pl. 1, fig. 10.
Conus guttatus (*non* Kiener); Bartsch, 1915: 13.
Conus elongatus (*non* Chemnitz); Turton, 1932: 12, pl. 3, No. 97.
Conus algoensis (*non* Sowerby); Turton, 1932: 14.
Conus grayi (*non* Reeve); Turton, 1932: 13.
Conus guttatus var. *variegatus* (*non* Kiener); Turton, 1932: 14.
Conus caffer (*non* Krauss); Janus, 1961: 8, pl. 3, figs. 11, 12.

Distribution: *C. tinianus* ranges from Tongaat (in Natal) to Arniston (living, Nat. Mus.: J. Dichmont; also coll. Mrs. C. M. Connolly) and Cape Agulhas (dead, coll. Mrs. C. M. Connolly, Mr. & Mrs. M. C. Giles). As pointed out by Kohn (*loc. cit.*), the original locality of Tinian Island (in the Marianas group) is erroneous. Algoa Bay is here selected as the type locality.

Recorded also from the quaternary of Chidenguele, about 150 km NE. of Lourenço Marques (Cox, 1939: 94).

Remarks: Although Tomlin & Winslow considered the name *Conus tinianus* to be inapplicable to South African shells, examination of the holotype by Kohn showed the traditional interpretation of this name to be correct.

As shown below, *C. tinianus* differs from the polytypic *C. mozambicus* Hwass in its very finely striate shoulder slope, in the absence of a finely denticulated tract on the distal half of the radula tooth (see Barnard, 1958: fig. 2b), and in the form of the egg capsules.

Samples of capsules from two different clusters both from Kwelera, near East London, have been examined (collected by Mrs. C. M. Connolly). Details of capsule shape varied somewhat, as did location of the exit window and presence or absence of surface sculpture. Each capsule is milky white, ovate to oblong-ovate in shape, usually bilaterally symmetrical, compressed, with one face more convex than the other. Stalk very thin, transparent and rather flimsy, about $\frac{1}{3}$ total height of capsule; basal expansion of stalk joins up adjacent capsules. Walls of capsule thin, surface smooth or with traces of feeble folds along the edges. Exit window well demarcated, oval, transparent, either apical or a short distance below the apex; in one capsule it is apical but acentral. In shape these capsules somewhat resemble those of *C. glans* Hwass (Kohn, 1961a: fig. 10 a, b), but differ in the peculiar membranaceous stalk. A typical capsule measures 19 mm in height, 8 mm in breadth.

As in *mozambicus* the eggs are unusually large and few in number, indicating direct development, as in that species and in *scitulus*. Four capsules from one brood were opened and found to contain 6, 11, 15 and 16 deep orange eggs, some uncleaved, others in the two and four cell stages. Uncleaved eggs averaged 1 mm in diameter. This contrasts sharply with the position in the 21 species of *Conus* studied by Kohn (1961, 1961a) in which eggs averaged in number from 48 to 43 500 per capsule, according to species, and in average diameter ranged from 125 to 490 μ . However, these 21 species came from the tropical Indian Ocean and Hawaii, while *tinianus*, *mozambicus* and *scitulus* are cold to warm tem-

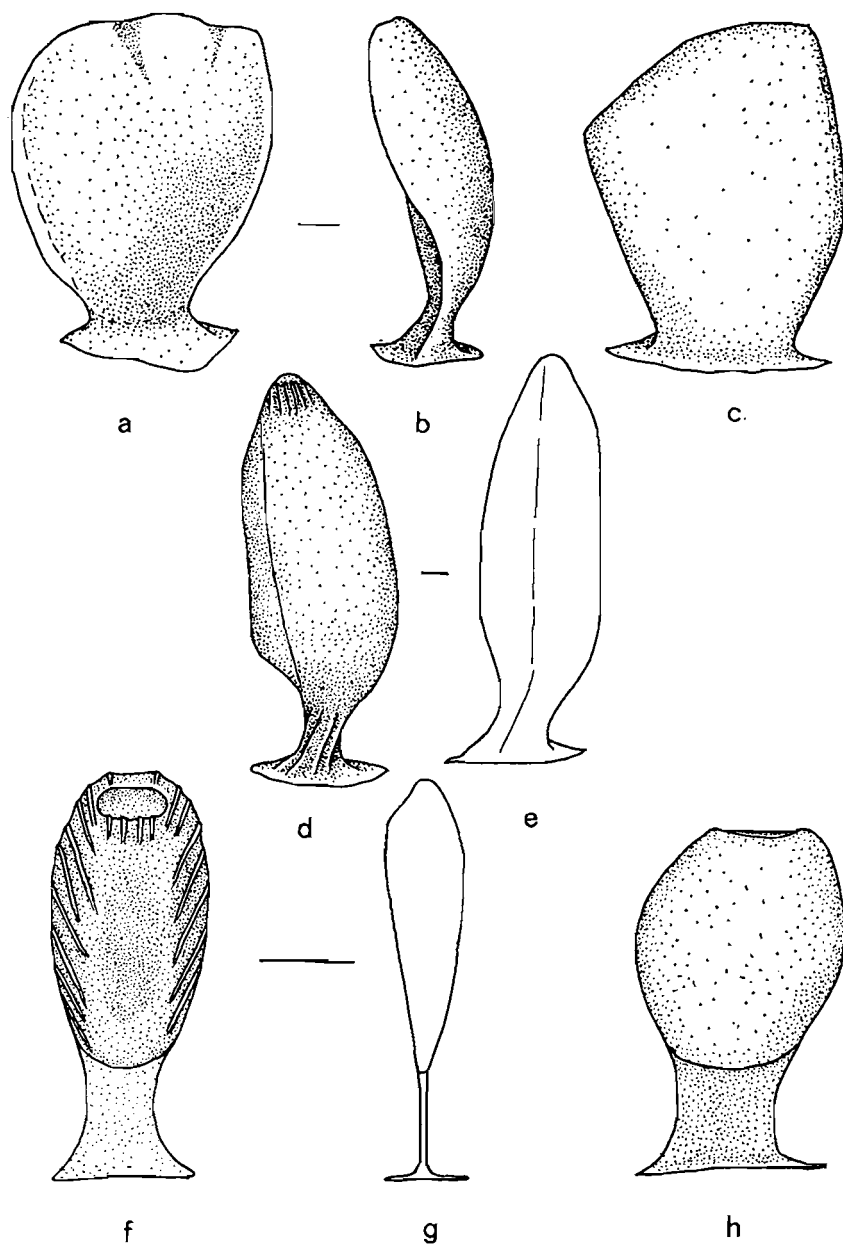


Fig. 4. Egg capsules of Cape *Conus*. a, b, Face and edge views of capsule of *Conus scitulus scitulus* Rve.; c, opposite face view of another capsule of same. d, e, Different aspects of capsule of *C. mozambicus mozambicus* Hwass in Brug. f, g, Face and edge view of capsule of *C. tinianus* Hwass in Brug.; h, face view of another capsule of same.

perate species. Thorson's (1950) rule, namely that there is a tendency for the production of small numbers of large yolky eggs with direct development in cold seas, but of numerous small eggs with pelagic development in the tropics, is clearly applicable here.

While long and detailed synonymies for *Conus tinianus* are available, reviewers have tended to be overconcerned with shape and coloration, and as a result have often confused members of the *mozambicus-lautus* complex with *tinianus*. Systematic re-examination of type material will be necessary before a complete synonymy can be set out, as early writers rarely bothered to mention or figure sculptural detail.

Although the types of *C. loveni* are lost (Janus, 1961: 8), Krauss's excellent description and figure leave no doubt as to its identity. The problem of *C. caffer* Krauss is discussed under *mozambicus*.

C. alfredensis Bartsch was referred to the synonymy of *Conus elongatus* 'Chemnitz' [= *C. mozambicus*] by Barnard (1958: 90) presumably on account of the narrow shape. *C. tinianus*, however, varies greatly in shape, and on geographic grounds I follow Tomlin (1937: 210) in synonymizing *alfredensis* with *tinianus*. Bartsch's statement that the shoulder bore 'a few feebly incised spiral lines' is unfortunately not very clear, but their feebleness, together with the fact that they are not shown in his figure, would also indicate *tinianus*.

Turton's figure of his '*Conus elongatus* Chemn.?' clearly shows a malformed juvenile *tinianus*. Turton's and Bartsch's records of *Conus grayi* Reeve, *C. guttatus* Kiener and *C. variegatus* Kiener are undoubtedly based on specimens of the present species. These three appear to be synonyms of the variable West African *bulbus* Reeve, judging by material in the Natal Museum from Angola (Luanda and Porto Alexandre).

Shell variation in *C. tinianus* seems to be entirely individual, and the species must be regarded as monotypic; many of the colour variants (e.g. the violaceous and brighter red/orange tones) appear to be produced or at least considerably enhanced by beach wear, as pointed out by Barnard (1958). The animal seems to exhibit signs of colour polymorphism, being typically orange-red, but occasionally yellow or black. It lives chiefly under rocks lying on sand or gravel in low tide pools. Although the radula belongs to the group classed by Lim and by Endean & Rudkin (loc. cit.) as vermivorous, two reports are available of specimens found devouring *Thais capensis* (Petit) (Mrs. C. M. Connolly, *in litt.*, and C. Walker, 1961, *Conchological Society of South Africa*, circular 20: 3).

Conus mozambicus Hwass in Bruguière

This species is readily distinguishable in all its different forms from *C. tinianus* Hwass on account of the presence of 6–8 coarse spiral lirae on the shoulder-slope, these being clearly visible to the naked eye. In *C. tinianus* this area bears numerous very fine spiral striae, sometimes forming a micro-cancellate sculpture with the growth lines. Although typically much more elongate (sometimes almost subcylindrical) in shape than *tinianus*, specimens of the eastern subspecies of *mozambicus* usually resemble the latter in shape, while an occasional aberrant *tinianus* may be almost as narrow as a typical west Cape *mozambicus*.

Unlike *tinianus* each radula tooth in the adult condition has a more or less extensive denticulated tract situated just distally to the middle (fig. 5a). These fine denticles have their ontogenetic origin as a duplication of the serrated ridge which traverses this region.

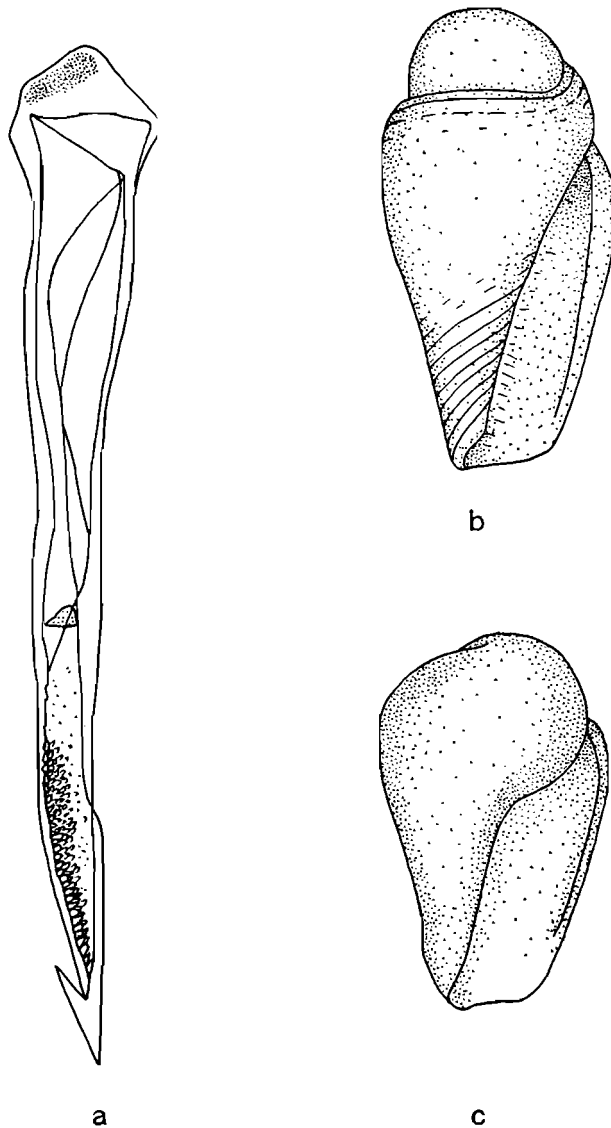


Fig. 5. a, Radula tooth of *Conus mozambicus mozambicus* Hwass in Brug. b, c, Veliconchas of *C. scitulus simplex* Sow. and *C. mozambicus mozambicus* Hwass in Brug., respectively.

A number of egg capsules (fig. 4d, e) of the nominate subspecies from Kommetjie have been examined (collected by Mrs. C. M. Connolly). These represent a type unlike any figured by Kohn (op. cit.). Each is oblong-ovate in shape, with one side markedly more convex than the other, tapering apically to a narrowly rounded summit, and basally

to a thick, laterally flattened stalk; the whole capsule inclines at an angle to the basal disc, which does not appear to join adjacent capsules together. Capsule wall very tough and thick, yellowish-white in colour, surface with traces of feeble longitudinal folds apically and on stalk: exit window indistinct. A typical capsule measures: height 17 mm, width 6,7 mm, thickness 4,7 mm. Two capsules were opened and found to contain 19 and 23 eggs, all in the 2 and 4 cell stages; the greater diameter of the former averaged about 1 mm. Another contained 19 veliconchas of very characteristic form. These consisted of $1\frac{1}{2}$ whorls, the nuclear one being somewhat depressed, and the body whorl markedly pyriform in shape. Dimensions $2,3 \times 1,5$ mm. Colour golden brown, surface smooth, except for fine growth lines.

As here defined, *Conus mozambicus* is polytypic, with two subspecies. The nominate one is restricted to the western Cape, along that part of the coast under the influence of the Benguela current, and in the False Bay–Agulhas transitional area (discussed above under *scitulus*); it is normally markedly slender, drab or sombre in colour and attains a relatively large size. The eastern subspecies, to which the name *lautus* is here provisionally applied, inhabits that part of the shoreline influenced by the cool, counter-current which flows eastwards up the coast (cf. Mallory, 1961: 33 et seq.). It has evidently developed under somewhat higher temperature conditions than *mozambicus* although it seems to reach its eastern limits in the East London area. The ranges of the two subspecies seem to overlap in the Cape Agulhas region, although only a few *lautus*—beachworn at that—have been examined from there; definite signs of hybridization have not yet been observed. The subspecies *lautus* is apparently smaller, more conical and more brightly coloured, although in most of the available material the coloration has undoubtedly been enhanced by beach wear. Moreover an occasional specimen may be found in which the colour is dark brown as in the nominate subspecies, while others may resemble the latter in proportions. Nevertheless nothing is to be gained at this stage by synonymizing the two, as all the material so far seen can be referred to the correct population, even without recourse to locality data. Nor have the two ever been confused in the literature, as far as can be judged.

Conus mozambicus mozambicus Hwass in Bruguière

(Fig. 4d, e; fig. 5 a, c; fig. 6, left)

Conus elongatus Chemnitz, 1788 (non-binomial): 92, pl. 144A, figs. 1 & k; Barnard, 1958: 90, fig. 2c; Barnard, 1969: 607.

Conus elongatus Holten, 1802: 39.

Conus mozambicus Hwass in Bruguière, 1792: 696, pl. 337, fig. 1; Kohn, 1968: 470, pl. 6, fig. 76 (lectotype); Marsh and Rippingale, 1964: 70, pl. 9, fig. 16.

Conus informis Hwass in Bruguière, 1792, 699, pl. 337, fig. 8; Kohn, 1968: 461, pl. 5, fig. 54 (lectotype); Marsh & Rippingale, 1964: 124, pl. 18, fig. 11 *syn. nov.*

Conus caffer Krauss, 1848: 131, pl. 6, fig. 24 *syn. nov.*

Distribution: Lüderitzbucht to Stilbaai (Barnard, 1958, 1969). Type locality 'Moçambique'; although this has been commonly accepted as a valid locality record, the present author has seen no sign of this species from any locality east of Stilbaai, either in the field or in the numerous private and public collections examined. The original type locality is here rejected and emended to Table Bay; the holotype, as figured by Kohn, is fully comparable with west coast shells. *C. informis* probably came from False Bay.

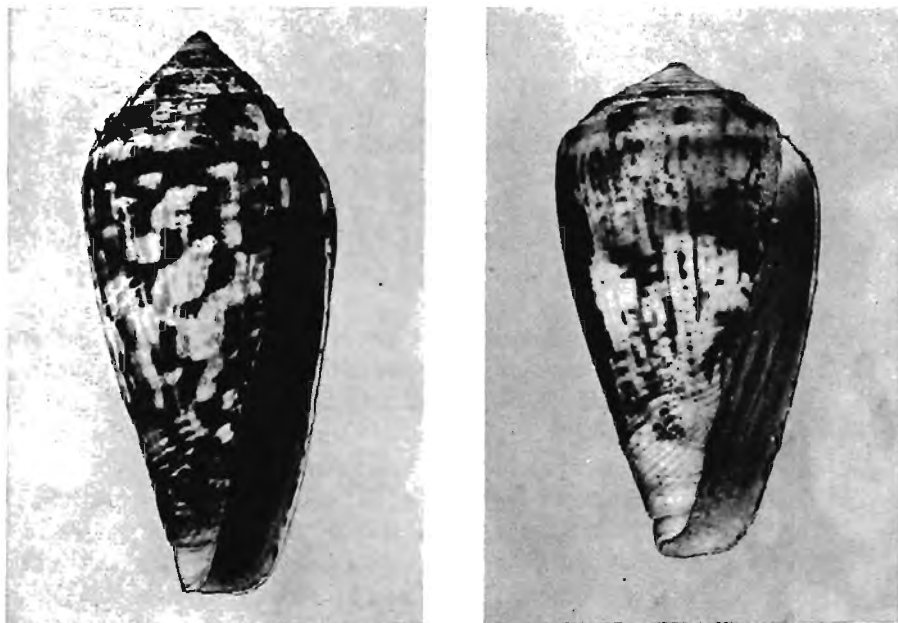


Fig. 6. *Conus mozambicus* Hwass in Brug. Left, *C. mozambicus mozambicus*, vividly marked example from Miller's Point, False Bay, $44,7 \times 20,7$ mm. Right, *C. mozambicus lautus* Rve., live-taken shell from Skoenmakerskop, near Port Elizabeth; dimensions $29,4 \times 15,7$ mm.

Characteristics: Distinguished from subspecies *lautus* chiefly by the more elongate shape. Typically too, the coloration is drab or sombre, consisting chiefly of various shades of brown, without sharply defined or regular markings. The most common form (on the west coast, at all events) is almost uniform dark brown, with indications of slightly paler blotches medially. Lighter shades of brown, with a series of darker brown blotches on the shoulder slope and some degree of development of articulated light and dark transverse lines are also common, particularly in False Bay. In the latter area specimens with wavy dark brown axial markings (consisting either of irregular blotches or distinct stripes) on a violaceous white ground (*informis* Hwass) are not uncommon. Yet others are pinkish-white with a few spiral rows of brown dashes and a series of brown subsutural blotches, while pure white shells have even been found. Finally, in some False Bay shells the ground colour is bright brownish-orange, reminiscent of some forms of *C. tinianus*.

Although the coarsely lirate shoulder is almost always a conspicuous feature, a shell from Possession Island, South West Africa (Nat. Mus.), shows only fine striae, although it is typical in other respects. At all events, a detailed investigation and analysis of variation patterns throughout the range of the nominate subspecies would be of the greatest interest. At Cape Agulhas the typical form is replaced by a dwarf local race, the largest available specimen of which measures only $27,3 \times 14,3$ mm (coll. Mrs. C. M. Connolly). The colour in this form is usually a very dark brown, but is occasionally pale yellowish. Dimensions of typical form: 70×31 mm, 68×33 mm (Barnard, 1959).

Remarks: Unfortunately the appropriate name of *elongatus* was not validated until 1802 (see Winckworth, 1943: 147), Chemnitz's names in the *Neues systematisches Conchylien-Cabinet* having been rejected by the I.C.Z.N. (opinion 184). *C. informis*, as is apparent from Kohn's figure (loc. cit.) of the lectotype, is based on a strigate form of this species, not uncommon in False Bay. *Conus caffer* Krauss has generally been regarded as a synonym of *C. tinianus* (Tomlin, 1937: 224; Barnard, 1958: 91), but the original figure shows a slender *mozambicus*-like shell, with conspicuous grooves on the shoulder. The locality given by Krauss, 'In litore capensi et natalensi', is of no assistance. The resolution of *caffer* as a synonym of *mozambicus* accounts for the otherwise inexplicable omission of the latter from Krauss's account. Unfortunately a complication has arisen with the designation of a lectotype for *C. caffer* by Janus (1961: 8). Janus follows Tomlin in quoting the latter as a synonym of *C. aurora* [= *tinianus*], and his photographs of the 'lectotype' (pl. 3, figs. 11, 12) certainly seem to show a specimen of that. However, as Janus himself remarks, this specimen shows little resemblance to Krauss's figure, and one is forced to the conclusion that either the type series was a composite one (which would explain the wide-sweeping type locality given by Krauss), or else subsequent mixing of specimens has occurred. At all events Janus's lectotype designation must be rejected.

Habitat as in *C. scitulus simplex*, although often in less sheltered situations; lives down to 17 m (Day, Field & Penrith, 1970: 74).

Conus mozambicus lautus Reeve

(Fig. 6, right; fig. 7)

Conus lautus Reeve, 1844: pl. 46, sp. 255; Turton, 1932: 12; Marsh & Rippingale, 1964: 124, pl. 18, fig. 10. *Conus inflatus* (non Sowerby, 1833); Marsh & Rippingale, 1964: 121, pl. 17, fig. 16. *Conus aurora* (partim); Tomlin & Winslow, 1927: 43; Barnard, 1958: 91.

Distribution: Cape Agulhas, worn (coll. Mrs. C. M. Connolly), Jeffreys Bay, dead (Nat. Mus., E. L. Mus.); Skoenmakerskop (just west of Port Elizabeth), living (Nat. Mus.); Algoa Bay, dead (Nat. Mus.); Port Alfred (Turton); East London, dead (Nat. Mus.). The type locality was originally stated to be unknown, but according to Mr. S. Fenwick the holotype in the British Museum (Natural History) is accompanied by a slip bearing the locality 'Rio Grande': As doubt exists as to the true identity of this specimen (see below), the subject of a type locality must be left in abeyance.

Characteristics: An exceedingly variable subspecies, both in colour and shape, although the latter is normally constant enough to be used as a distinguishing feature. As a rule *C. m. lautus* resembles *tinianus* in form, although it is usually slightly more shouldered. Some specimens are, however, as narrowly cylindrical as the nominate subspecies, while others are strongly conical, superficially resembling *C. pictus* Reeve. Typically *lautus* is orange-pink in colour, with the shoulder slope, base and median zone pinkish-white, with axially aligned reddish-brown blotches; intervening areas show articulated lines of brown dots. Other specimens are rich reddish-brown, blotched with pinkish-white, with a dark median zone; this is the *Conus inflatus* of Marsh & Rippingale. Yet others are dark brown, with obscure paler markings. However, it should be noted that some of these colour patterns are undoubtedly the result of beach wear. The only live-taken shell available is violaceous-

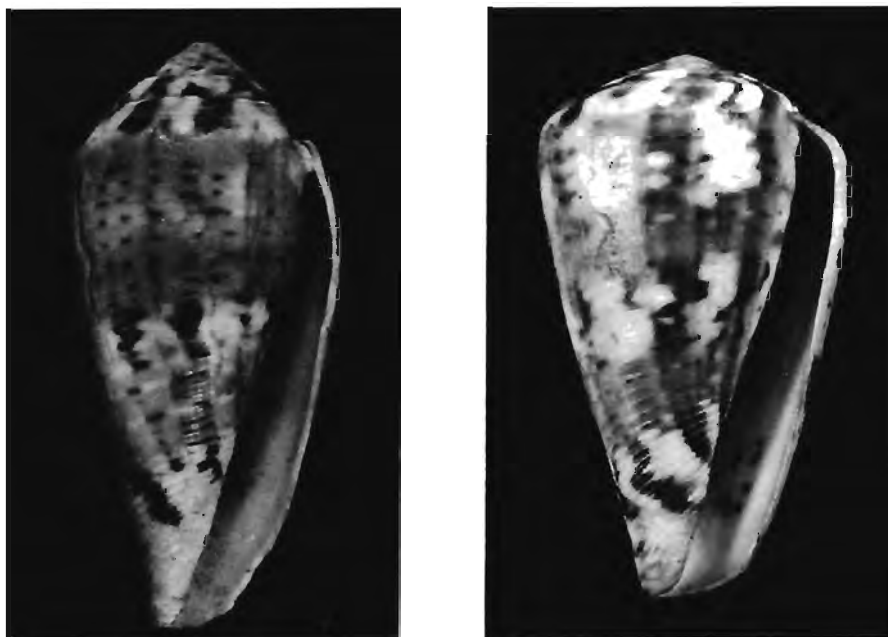


Fig. 7. *Conus mozambicus lautus* Rve., extreme variants. Left, narrow form (44,4 × 20,8 mm), from East London. Right, broadly conical form (35,7 × 20,8 mm), Jeffreys Bay.

white, sparsely marked with articulated lines of brown dots, and with a scattering of small brown blotches, chiefly on the shoulder slope.

Dimensions: 44,2 × 20,8 mm; 35,7 × 20,8 mm; 40,5 × 21,3 mm.

Remarks: Although I am following conventional usage in applying the name *lautus* to the present taxon, that name should probably be regarded as a *nomen dubium*. Mr. S. Fenwick (pers. comm.) reports that the holotype is in an advanced stage of beach wear, with faded markings somewhat reminiscent of *C. infrenatus* Reeve, and with no sign of any remaining sculpture. The name cannot be applied with any degree of certainty, and will probably have to be discarded. However, the name *lautus* has been used provisionally in preference to creating a new name, as future holotype studies may well show that some of the species traditionally synonymized with *tinianus* on the basis of published descriptions should in fact be referred here.

Conus inflatus Sowerby (1833: fig. 41), applied by Marsh & Rippingale to a colour variant of this subspecies, appears to be allied to *C. conspersus* Reeve, with which Tryon (1884: 58) in fact synonymized it.

Neither the radula nor the egg capsules of *lautus* have been examined.

ABBREVIATIONS

- Nat. Mus. = Natal Museum, Pietermaritzburg.
 S. Afr. Mus. = South African Museum, Cape Town.
 E.L. Mus. = East London Museum, East London, South Africa.

CO-ORDINATES

Only the more obscure localities are listed here, well-known ones such as Table Bay and East London being omitted.

Kommetjie	34°09' S., 18°20' E.
Buffels Bay	34°19' S., 18°28' E.
Miller's Point	34°14' S., 18°28' E.
Simonstown	34°12' S., 18°26' E.
Muizenberg	34°06' S., 18°28' E.
Cape Hangklip	34°24' S., 18°50' E.
Hermanus	34°25' S., 19°14' E.
Cape Agulhas	34°50' S., 20°00' E.
Arniston	34°40' S., 20°14' E.
Stilbaai	34°21' S., 21°25' E.
Gonubie	32°56' S., 28°01' E.
Bulugha	32°53' S., 28°05' E.

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